FRACTURE OF THE BASE OF THE SKULL WITH THE ESCAPE OF THE CEREBRO-SPINAL FLUID, FOLLOWED BY FACIAL PARALYSIS AND RECOVERY.

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UNFORTUNATELY fractures of the skull, whether of the base or the vault, are not uncommon, and the results as regards treatment and recovery are most unpromising. Although there is nothing novel about reporting a case of recovery, the following patient presented some symptoms and collateral developments which are of interest to the neurologist. Besides the patient suffered, undoubtedly, from fracture of the base of the skull without presenting some of those symptoms which we are accustomed to associate with that injury.

The patient, a clergyman, forty-nine years of age, was thrown from an Arabian saddle, while riding rapidly in the Orient, on February 24, 1890. He struck heavily on the right side of his head, causing no wound, however, except a superficial scratch from which a few drops of blood oozed; a large contusion over the left thigh indicated where he had been forcibly thrown against the high wooden back of the saddle. The rider had freed his feet from the stirrups when the horse began to run, so he was not dragged for any great length. He did not lose consciousness, even momentarily, as he remembers having been picked up by two companions. At the moment when the upright posture was assumed, a most undescribable sensation of revolution was manifest, a rapid continual substitution of the heels and head running like a wheel. This lasted but a few seconds. He begged to be laid down flat on the ground, and then began to vomit, which was followed, at its cessation, by a very copious discharge from the bowels. In a short time he was placed on another horse and carried to Tiberius, and while on this journey he felt something flowing from the left ear, which he thought at first was blood, but which proved on examination to be a pale, colorless fluid, sufficient in quantity to saturate two or three handkerchiefs; this discharge continued during the night, saturating the pillow-slip and pillow of the hospital bed. At this time he had no particular symptoms except headache and pain from the hip. Two days afterward, the dripping from the ear having ceased, he left Tiberius on a stretcher, laid across the backs of two mules, for an eight-hours' journey to Nazareth. The unevenness of the mules' steps on a more uneven road caused him a considerable jarring, which was followed by a transitory headache and vertigo.

On the second of March—that is to say, six days after the injury—he began to notice that the left angle of the mouth was drawn downward and the right apparently raised, the right eye open and inability to close it completely, in fact all the symptoms of facial paralysis associated with a partial loss of taste. The symptoms which he then complained of were principally dizziness, especially when attempting to turn around, or in raising or in stooping suddenly. Associated with this was a considerable unsteadiness in walking, a feeling of thickness, cloudiness, and heaviness in the head, and a sensation of pressure and tightness in and around the cranium. These symptoms became less severe as they were remote from the accident. He also noticed at this time a difficulty of hearing in the right ear.

The treatment at this time consisted principally in the administration of the iodide and bromide of potassium. By slow stages the patient journeyed to Venice, reaching there in May. An examination of the right ear at this time showed a slight opacity of the tympanic membrane and a remarkable cicatrix in the postero-inferior quadrant of the drum. The watch could not be heard unless placed in contact with the ear, and Galton's whistle at a distance of four inches. No response to whispering. The tuning-fork gave increased response, showing, of course, that the mischief was in the nervous mechanism and not in the bone-conducting apparatus. The facial palsy began to disappear about three weeks after its advent and had by this time completely disappeared.

After a few months the patient returned to this country, the subjective symptoms continuing to ameliorate, the objective remaining the same. An examination of the ear, eye, and special senses at this time showed them to be apparently normal, with the exception of those related, referable to the right ear. In the latter part of January of the present year, when all his symptoms had disappeared with the exception of a feeling as if a fairy film of gauze was spread over the interior of his skull-cap, which, however, gave him no particular uneasiness, he had a sort of a relapse in his symptoms after having jumped a few steps off a stairs. The vertiginous and symptoms of unsteadiness returned, but they disappeared in the course of a few weeks, and he is now apparently restored to health.

It will be seen that the conditions on which the diagnosis of fracture of the base of the skull was based, were the history of the injury, the escape of the cerebro-spinal fluid, the developing facial paralysis, and the rupture and resulting cicatrix in the tympanum. It is unnecessary to state here the symptoms of fracture of the base of the skull, whether they involve the anterior, middle or posterior fossa. The writings on this subject are both extensive and familiar. Fractures of the middle fossa are undoubtedly most frequent and probably associated with the best marked symptoms. Of these symptoms, bleeding from the ear has long been considered the one to which most diagnostic weight should be attached. And this is probably rightly so; but care should be taken in estimating its weight as a diagnostic factor; for it is very possible that in many cases of injury to the cranium, attended with hemorrhage, this source of bleeding is from the rupture of the blood-vessels in the membrana flaccida, or Schrapnell's membrane, as it is sometimes called. Unquestionably, the line of fracture may involve the floor of the tympanic cavity, which is formed by a thin plate of bone roofing in the jugular fossa, and separating it from the internal jugular vein and the internal carotid artery. Therefore it becomes a matter of importance to know how much blood has escaped and for how long a time the hemorrhage has continued, and also, perhaps, a fact of some magnitude would be in determining whether it is arterial or venous blood; for if a large quantity of fresh dark-colored blood is discharged, it is almost a certainty that the blood comes from the internal jugular vein. On the other hand, if it is large in amount, continuous, and light-colored, it probably comes from the internal carotid, although such a severe hemorrhage may possiby come from the blood-vessels in the tympanum.

In the case above described there was absolutely no hemorrhage from the ear, and this, one would judge from a review of the reported cases, was an exceptional condition, in cases where the other symptoms were well marked; however, Buck in his article on "Ear Diseases," in the International Encyclopædia of Surgery, in speaking of fracture of the base, unhesitatingly says: "I am satisfied, from examinations which I have made in cases of injury to the head of recent occurrence, that fracture of the temporal bone often occurs without the slightest bleeding from the external auditory canal." And the history of this case would tend to confirm that statement.

Erichsen says that copious hemorrhage from the ear to the extent of many ounces has been known to occur from a fracture of the anterior and inferior part of the meatus auditorius externus, in consequence of the condyle of the lower jaw having been forcibly driven up against it, the jaw itself having been fractured. And Battle in a recent article in the *Lancet* described a case which showed a peculiar association of fractures, viz., fracture of the bony wall of the external meatus and also a fracture of the petrous part of the temporal bone without being associated with rupture of the membrani tympani, so that although fracture of the posterior and middle fossa of the skull was properly diagnosed, the fracture in the latter position was supposed to be indicated by the bleeding from the ear, which in reality came only from the external meatus. Sir Prescott Hewitt, on the other hand, considers that bleeding from the ears in severe injuries of the head has, for many years past, been held, and with good grounds, to be one of the most valuable signs of fracture of the base. But this bleeding, to be of any value, must continue for some time and be of a serious nature. That this is partly true no one will question; but the fact that such injuries may occur without hemorrhage, and also with long-continued bleeding, having its origin other than from the large vascular channels about the middle ear, is incontrovertible.

The escape of the watery fluid from the ear in this case was in all probability the cerebro-spinal fluid, and the time and manner in which it came on was rather characteristic than otherwise; that is to say, the watery discharge resulting from this injury comes on more often shortly after the receipt of the fracture, than directly, and frequently when the patient is moved or jarred. When the appearance of a watery discharge is delayed for more than twenty-four hours following injury to the side of the head, it is important to discover whether or not the fluid results from laceration of the mucous membrane of the ear, with a co-existing rupture of the drum, and followed by inflammation, which inflammation is characterized by the production and escape of a serous liquid very much resembling the cerebro-spinal fluid physically, but differing from it chemically in so much as it has a greater quantity of albumen and saline matters. However, in cases with the appearance of a fluid, before sufficient time has elapsed for inflammatory phenomena to set in, and in fact ceasing, although profuse in amount, within a shorter time than it takes inflammation to throw out a serous fluid, this associated with after-developing facial paralysis, is the best corroborative evidence that the discharge is the cerebro-spinal fluid. This fluid may sometimes be discharged from the nose and the eyes, but this is comparatively rare, and when from the latter it is more indicative of fracture of the anterior fossa, as is also subconjunctival extravasation.

The ridge of the aqueductus Fallopii containing the facial and auditory nerves is situated on the inner wall of the tympanic cavity, and the fracture in this case probably involved that and perhaps extending down to the internal auditory meatus. The time elapsing between the receipt of the injury and the appearance of the paralysis was, perhaps, somewhat longer than ordinary, and taken in conjunction with the duration of this symptom, would show that the paralysis was partly dependent on the surrounding inflammation necessarily resulting from such an injury, without being associated with serious disorganization in the nerve itself.

The explanation of the partial loss of the sense of taste is somewhat more difficult and largely theoretical. But most likely it must be solved through the agency of the chorda tympani nerve. This nerve is usually said to be given off from the facial in the aqueductus Fallopii as it passes directly downward at the posterior part of the tympanum, then passing from below upward in a distinct canal parallel to the aqueductus Fallopii and enters the cavity of the tympanum. It afterward emerges through the canal of Huguier and meets the gustatory division of the inferior maxillary nerve between the two pterygoid muscles and afterward proceeds to the submaxillary gland. By means of this communication in all probability is to be explained the disturbance noted in the functions of the gustatory nerve. And this becomes much more apparent if we believe, indeed, that the lingual branch of the fifth nerve gives off the chorda tympani and that most of the fibres of the chorda tympani pass into the petrosal and thus reach the spheno-palatine ganglion and second part of the fifth nerve—these fibres conducting taste impressions from the front of the tongue. The gangliform enlargement on the seventh also receives a very small connection by means of the small petrosal, which connects the Otic ganglion through Jacobson's nerve with the glosso-pharyngeal. Certainly if there was a disturbance of function in the chorda tympani symptoms referable to its influence on the secretion of the submaxillary gland would be manifest, as this nerve contains both vaso-dilator and true secretory fibres. But outside of the dribbling of the saliva associated with the facial paralysis, the patient noticed no particular symptoms.

The circular revolutions on the transverse axis of the body which were so distressing to the patient immediately after the accident were probably due to disturbance in the endolymph in the semicircular canals. The functions of these canals have not been thoroughly established physiologically, but it is more than probable that they have an important function in contributing to the maintenance of the equilibrium of the body, as when they are destroyed in the pigeon, it manifests peculiar rotatory movements. Whether or not the endolymph in the semicircular canals suffered a molecular disturbance, or was partially or completely lost, cannot be said with any approach to accuracy.

As to what the return of the headache, vertigo, and other such symptoms, a few months back were due, I will leave for others to theorize on; but this I may be allowed to say, that the patient has a great tendency to be hypochondriacal and is of a lithæmic constitution. So that these symptoms, so common to the latter condition, are not to be allowed too much weight as indicating any trouble in the head *per se*. It is unnecessary to speak of the treatment, so limited and well known is it. The treatment for ordinary acute inflammation of the middle ear will give as good results here as any other measures. Great care should be taken to avoid purulent infection of the meninges, and especially so if there had been previous to the time of the fracture any old inflammation of the middle ear. In such conditions antiseptic measures cannot be used too vigorously.

In conclusion I wish to thank my friend Dr. A. Gaston Roeth, of Boston, for kindly referring the case to me.

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